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68

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/072,073	02/08/2002	Toshihito Tsuga	TI-31619	9458
23494	7590	02/25/2004	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			KORNAKOV, MICHAIL	
			ART UNIT	PAPER NUMBER
			1746	

DATE MAILED: 02/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/072,073

Applicant(s)

TSUGA ET AL.

Examiner

Michael Kornakov

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following: Page 3, 3-rd paragraph recites that “the substitution ratio is **unity** when cleaning solution in the same amount is fed per unit time into a cleaning solution tank of unit volume”, which is not readily ascertainable. Appropriate clarification is required.

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 3 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- The recited “the prescribed time corresponds to a substitution ratio of the cleaning solution in the cleaning solution tank of 0.4 or more” constitutes an indefinite subject matter, because it is not clear what the limitation of claim 3 stands for. It is not clear, whether it indicates that the tank is not fully filled with cleaning solution, or the wafer is not fully dipped into the cleaning liquid when feeding of ultrasonic waves starts, or it provides for the certain rate of substitution of the cleaning solution in the cleaning tank. Due to its ambiguity, claim 3 is interpreted as indicating that the passage of the prescribed period of time, which corresponds to feeding time of the ultrasonic

Art Unit: 1746

waves into the cleaning solution, starts when the wafer is at least partially dipped into the cleaning solution.

- Claim 5 recites the limitation "the cleaning time". There is insufficient antecedent basis for this limitation in the claim.
- Claims 12, 14, 16, 18 are rejected because of their dependency and failure to remove ambiguity of parent claims.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 3, 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Guldi (U.S. 6,488,037).

Guldi teaches a method of cleaning integrated circuit wafers comprising immersing the said wafers into a chemical bath with cleaning solution and initiating an ultrasonic transducer to generate ultrasonic energy in order assist in cleaning, wherein the ultrasonic energy is initiated after insertion of wafers into the chemical bath and wherein the steps of initiating and ceasing the ultrasonic energy are repeatedly provided before removing wafers from the chemical bath, thus clearly indicating the "passage of

Art Unit: 1746

prescribed period of time", within which immersed wafers are not subjected to ultrasonic action (Abstract; col.10, lines 4-11, 25-27,34,35). Regarding claim 6, Guldi teaches the use of deionized water (col.4, line 23). Regarding claim 3 Guldi teaches full immersion of wafers into cleaning solution (Fig 1, 2), which reads on "a substitution ratio of 0.4 or **more**", as instantly recited and interpreted by the Examiner.

Therefore, all the limitations of instant claims are met by Guldi.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

Art Unit: 1746

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 2, 4, 5, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guldi (U.S. 6,488,037).

While teaching the cleaning process with the steps identical to those instantly claimed, Guldi does not specifically indicate the period of time within which wafers are not subjected to ultrasonic treatment (compare to “prescribed time”, as instantly recited in claim 2), period within which wafers are subjected to ultrasonic treatment (compare to “feeding time”, as instantly recited in claim 4), and the cleaning time (as per the instant claim 5. These time parameters are result effective, because they affect the cleaning efficiency and production output, which decreases due to wafer damaging during extended ultrasonic treatment. However, discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980).

9. Claims 7, 8, 11, 12, 13, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guldi ((U.S. 6,488,037) in view of Nagahara et al (U.S. 6,444,255).

The teaching of Guldi does not specifically indicate the use of hydrogen-enriched ultra pure water. However Guldi motivates the skilled artisan to use a wide range chemical bath in different cleanups (col.1, lines 38-50; col.4, lines 19-26).

Art Unit: 1746

Nagahara et al teach that ultrasonic cleaning of substrates with a hydrogen gas dissolved water provides better results due to raised detergency of such water (col.4, lines 3-26, 44-51). Therefore, one skilled in the art motivated by teaching of Nagahara et al would have found it obvious to utilize hydrogen gas dissolved water of Nagahara et al in order to increase the effectiveness of cleaning in the method of Guldi and thus to arrive at the instantly claimed subject matter.

10. Claims 1, 2, 3, 4, 5, 6, 9, 15, 16, 17, 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al (U.S. 6,004,399) in view of Guldi ((U.S. 6,488,037).

Wong et al disclose conventional processing of semiconductor wafers, wherein HF acid treatment of wafers followed by immersing and rinsing them with DI water while applying sonic energy (col.21, lines 9-14). Wong et al remain silent about specificities of such rinsing.

Guldi teaches a method of cleaning integrated circuit wafers, which is readily implementable into semiconductor manufacturing process, the said method comprising immersing the said wafers into a chemical bath with cleaning solution and generating sonic energy in order assist in cleaning, wherein the sonic energy is initiated after insertion of wafers into the chemical bath, thus providing for thorough cleanup (Abstract; col.2, lines 61-63; col.10, lines 4-11, 25-27,34,35).

Because both Wong et al and Guldi are concerned with semiconductor processing and Guldi teaches specificities of rinsing in such processing, one skilled in the art motivated by the teaching of Guldi would have found it obvious to utilize the

Art Unit: 1746

immersing rinsing method of Guldi in the conventional treatment process of semiconductors, described by Wong et al with the reasonable expectation of success.

11. Claims 1, 7, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al (U.S. 6,004,399) in view of Guldi (U.S. 6,488,037) and in further view of Nagahara et al (U.S. 6,444,255).

The combined teaching of Wong et al and Guldi differs from the instant claim 20 by not specifying that DI water utilized in the sonically enhanced rinsing step of Wong et al and Guldi is hydrogen enriched.

Nagahara et al teach that sonic cleaning of substrates with a hydrogen gas dissolved water provides better results due to raised detergency of such water (col.4, lines 3-26, 44-51). Therefore, one skilled in the art motivated by teaching of Nagahara et al would have found it obvious to utilize hydrogen gas dissolved water of Nagahara et al in order to increase the effectiveness of cleaning in the method of Wong et al and Guldi with the reasonable expectation of success.

12. Therefore, combination of references renders claims 2-20 prima facie obvious and properly rejected under 35 U.S.C. 103(a).

13. Applicant should note that additional prior art cited in PTOL-892 shows the general state of the art.



Art Unit: 1746

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (571) 272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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2/17/04

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Examiner  
Art Unit 1746

Application/Control Number: 10/072,073

Page 9

Art Unit: 1746